

Math 3010 Midterm: 22 February, 2016

Do all of the following problems on a separate sheet of paper. You must show your work for full credit, but please also draw a box around your final answers. If you use more than one sheet of paper, be sure to write your name on all pages and staple them together. You may not use any aids—calculators, notes, books, etc.—during this exam.

- (1) (4 points) Express $\frac{9}{13}$ as an Egyptian fraction.
- (2) (4 points) Use the Babylonian method (or any other you prefer) to find an integer Pythagorean triple (x, y, d) (that is, with $x^2 + y^2 = d^2$) such that $\frac{x}{y} + \frac{d}{y} = 13$.
- (3) (4 points) What approximation to π results from approximating the area of a circle by the area of an inscribed regular *octagon* (8 sides)?
- (4) (5 points) Find an integer N satisfying the simultaneous congruence

$$N \equiv 5 \pmod{17},$$

$$N \equiv 8 \pmod{19}.$$

Describe the set of *all* such integers N (this last part is worth only one out of the five points).

- (5) (5 points) Match each of the following events to the corresponding (approximate) date. (For your answer, just write the letter labeling each of the following items, followed by the date, eg “(z) 1984.”)
 - (a) Battle of Marathon (1st Persian invasion of Greece)
 - (b) Qin Jiushao’s work on solving polynomial equations
 - (c) Plimpton 322 written
 - (d) Liu Hui completes his commentary on the *Nine Chapters*
 - (e) The *Iliad* is written down by “Homer”
 - (f) Thales allegedly predicts a solar eclipse
 - (g) The trial and death of Socrates
 - (h) Sima Qian starts his history (*Shiji*)
 - (i) The Great Pyramid of Giza is completed
 - (j) The Qin emperor unifies China, ending the Warring States period

Here is the list of dates, plus two that you will not need:

1800 BCE

109 BCE

44 BCE

221 BCE

79 CE

490 BCE

263 CE

1247 CE

585 BCE

750 BCE

399 BCE

2560 BCE

- (6) (Bonus Question: 2 points) In the *Timaeus*, which regular polyhedra correspond to which elements? Give one of Plato’s reasons for the details of this correspondence.